

JAN 11 2007

Application No.: 10/825,716

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Docket No.: 595992000501

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1 - 16 (Canceled)

Claim 17 (Original): A method for cutting a material submerged in a conductive liquid medium, said method comprising:

- a) providing a cutting electrode having an elongate cutting portion;
- b) providing a return electrode;
- c) immersing said cutting electrode and said return electrode in said conductive liquid medium;
- d) applying a voltage between said cutting electrode and said return electrode such that said conductive liquid medium is heated to produce a vapor cavity around said elongate cutting portion and to ionize a gas inside said vapor cavity to produce a plasma;
- e) modulating said voltage in a modulation format comprising pulses separated by a pulse interval greater than 1 ms, wherein each of said pulses comprises a plurality of minipulses separated by a minipulse interval of less than 1 ms; and
- f) cutting said material with an edge of said elongate cutting portion.

Claim 18 (Original): The method of claim 17, wherein said pulses have a pulse duration selected in the range substantially between 10 μ s and 10 ms.

Claim 19 (Original): The method of claim 18, wherein the voltage of said pulses is varied during said pulse duration, such that a low voltage is applied for electrochemical generation of said gas and a high voltage is applied for generation of

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said plasma.

Claim 20 (Currently amended): The method of claim 17, wherein said minipulses have a minipulse duration selected in the range between 0.1 and 10 μ s and said minipulse interval is selected in the range between 0.1 and 10 μ s.

Claim 21 (Original): The method of claim 20, wherein said minipulse duration and a peak power are adjusted to permit spark discharges and to prevent arc discharges.

Claim 22 (Original): The method of claim 17, wherein each of said minipulses comprises micropulses having a micropulse duration selected in the range between 0.1 and 1 μ s.

Claim 23 (Original): The method of claim 17, wherein said minipulse interval is shorter than a lifetime of said vapor cavity, and wherein said pulse interval is greater than said lifetime.

Claim 24 (Original): The method of claim 17, wherein said minipulses exhibit alternating positive and negative polarities.

Claim 25 (Original): The method of claim 17, wherein said plasma has a temperature greater than 100 °C.

Claim 26 (Original): The method of claim 17, wherein the temperature of said elongate cutting portion is maintained between about 100 and 1,000 °C.

Claim 27 (Original): The method of claim 17, further comprising preventing charge transfer to said material.

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Claim 28 (Original): The method of claim 17, wherein said material is selected from the group consisting of biological tissue, cellulose and plastics.

Claim 29 (Original): The method of claim 17, wherein said elongate cutting portion has an aspect ratio of length to width larger than 1.

Claim 30 (Original): The method of claim 29, wherein said aspect ratio is larger than 5.

Claim 31 (Original): The method of claim 17, wherein said elongate cutting portion has a width between 1 and 250 microns.

Claim 32 (Original): The method of claim 31, wherein said elongate cutting portion has a width between 10 and 100 microns.

Claim 33 (Original): The method of claim 17, wherein said elongate cutting portion is a wire with diameter between 1 and 250 microns.

Claim 34 (Original): The method of claim 33, wherein said elongate cutting portion is a wire with diameter between 10 and 100 microns.

Claim 35 (Canceled)

Claim 36 (New): A method for cutting a biological tissue, comprising:

providing a cutting electrode having an elongate cutting portion;

providing a return electrode;

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applying a voltage between said cutting electrode and said return electrode such that a vapor cavity is produced around said elongate cutting portion gas inside said vapor cavity is ionized to produce a plasma;

modulating said voltage in a modulation format comprising pulses separated by a pulse interval greater than 1 ms, wherein each of said pulses comprises a plurality of minipulses separated by a minipulse interval of less than 1 ms; and

cutting said biological tissue with an edge of said elongate cutting portion.

Claim 37 (New): The method of claim 36, wherein said pulses have a pulse duration selected in the range substantially between 10 μ s and 1 ms.

Claim 38 (New): The method of claim 36, wherein the voltage of said pulses is varied during said pulse duration, such that a low voltage is applied for electrochemical generation of said gas and a high voltage is applied for generation of said plasma.

Claim 39 (New): The method of claim 36, wherein said minipulses have a minipulse duration selected in the range between 0.1 and 10 μ s.

Claim 40 (New): The method of claim 36, wherein said minipulse duration and a peak power are adjusted to permit spark discharges and to prevent arc discharges.

Claim 41 (New): The method of claim 36, wherein each of said minipulses comprises micropulses having a micropulse duration selected in the range between 0.1 and 1 μ s.

Claim 42 (New): The method of claim 36, wherein said minipulse interval is shorter than a lifetime of said vapor cavity, and wherein said pulse interval is greater than said lifetime.

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Claim 43 (New): The method of claim 36, wherein said minipulses exhibit alternating positive and negative polarities.

Claim 44 (New): The method of claim 36, wherein said plasma has a temperature greater than 100 °C.

Claim 45 (New): The method of claim 36, wherein the temperature of said elongate cutting portion is maintained between about 100 and 1,000 °C.

Claim 46 (New): The method of claim 36, further comprising preventing charge transfer to said biological tissue.

Claim 47 (New): The method of claim 36, wherein said elongate cutting portion has an aspect ratio of length to width larger than 1.

Claim 48 (New): The method of claim 47, wherein said aspect ratio is larger than 5.

Claim 49 (New): The method of claim 36, wherein said elongate cutting portion has a width between 1 and 250 microns.

Claim 50 (New): The method of claim 49, wherein said elongate cutting portion has a width between 10 and 100 microns.

Claim 51 (New): The method of claim 36, wherein said elongate cutting portion is a wire with diameter between 1 and 250 microns.

Claim 52 (New): The method of claim 51, wherein said elongate cutting portion is a wire with diameter between 10 and 100 microns.

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